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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,503	09/17/2003	Paul Taichiang Yu	GP-302212	4683

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EXAMINER	
AKRAM, IMRAN	

ART UNIT	PAPER NUMBER
1795	

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10/29/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/664,503	YU ET AL.	
	Examiner	Art Unit	
	IMRAN AKRAM	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 August 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) *11-19 and 24-28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 20-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 8/29/08 have been fully considered but they are not persuasive. The references still apply, albeit in different rejections necessitated by amendment.

2. Applicant argues on page 10 and 11 of Arguments that neither the Seaba reference nor Eguchi reference disclose connectors between the shift reactors and heat exchanger. Examiner respectfully disagrees. Surely, a connection means such as a pipe or pathway exists between these components of the respective inventions as they are in fluid communication with one another.

3. Applicant also argues that the heat exchanger and shift reactors of Seaba and Eguchi cannot be made integral. Examiner respectfully disagrees. Making components integral is not grounds for patentability—as discussed in the rejections below.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 3-10, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba (US 2002/0168307 A1).

8. Regarding claim 1, Seaba discloses a water-gas shift reactor system comprising: a first stage water-gas shift reactor **42** receiving a reformate gas, said first stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25); a heat exchanger **46** receiving the reformate gas from the first stage reactor, said heat exchanger cooling the reformate gas (paragraph 25), said heat exchanger including a catalyst **46A** that converts carbon monoxide and water to carbon

dioxide and hydrogen (Table II), said first stage water-gas shift reactor being coupled to an inlet end of the heat exchanger by a first connector (see figure 1); and a second stage water-gas shift reactor **50** receiving the cooled reformate gas from the heat exchanger, said second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25), said second stage water-gas shift reactor being coupled to an outlet end of the heat exchanger by a second connector (see figure 1). Seaba does not disclose, however, that the components are integral. This is a well-known means in the art to increase heat efficiency, however. It would have been obvious to one having ordinary skill in the art at the time of invention to make integral the shift reactors and heat exchanger of Seaba as the shift reactors surround the heat exchanger and integrating them would afford the invention better thermal efficiency. See MPEP 2144.04 V B.

9. Regarding claim 3, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

10. Regarding claims 4 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

11. Regarding claims 4 and 8-10, Seaba discloses the use of water in the heat exchangers (paragraph 25). Seaba does not, however, disclose the shift reactors to operate between the temperatures of 300 and 400 degrees Celsius. Seaba discloses varyijng temperatures and ranges for optimal conditions (paragraph 34), though, and so

it would have been obvious to one having ordinary skill in the art at the time of invention to modify the device of Seaba to operate at whatever temperatures appropriate for maximum efficiency of hydrogen production--the most desirable feature in the reforming art. Optimization of parameters such as temperature is a well-known, obvious modification to a device: See MPEP 2144.05 II A.

12. Regarding claim 5, Seaba discloses that the first stage reactor is a high temperature reactor operating at 450°C and the second stage reactor is a low temperature reactor operating at 250°C (see figure 2).

13. Regarding claim 6, Seaba discloses that the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (see figure 1).

14. Regarding claim 7, Seaba discloses that the water-gas shift reactor system is positioned between a primary reactor **34** and a preferential oxidation **60** reactor in the fuel processing system (see figure 1).

15. Regarding claim 20, Seaba discloses a fuel processing system for producing a hydrogen reformate gas, said system comprising: a primary reactor **34**, said primary reactor receiving a liquid hydrocarbon fuel and generating a reformate gas including hydrogen and carbon monoxide (paragraph 24); a first heat exchanger **38**, said first heat exchanger receiving the reformate gas from the primary reactor and cooling the reformate gas (paragraph 25); a water-gas shift reactor assembly including a first stage water-gas shift reactor **42** receiving the cooled reformate gas from the first heat exchanger, a second heat exchanger **46** receiving the reformate gas from the first stage reactor, said second heat exchanger cooling the reformate gas, and a second stage

water-gas shift reactor **50** receiving the cooled reformate gas from the second heat exchanger (paragraph 25), each of the first stage reactor, second heat exchanger and second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II); a third heat exchanger **54**, said third heat exchanger receiving the reformate gas from the second stage reactor and cooling the reformate gas (paragraph 25); and a preferential oxidation reactor **60**, said preferential oxidation reactor receiving the cooled reformate gas from the third heat exchanger, said preferential oxidation reactor including a catalyst that selectively oxidizes carbon monoxide to carbon dioxide in the reformate gas (see Table II).

16. Regarding claim 21, Seaba discloses that the first heat exchanger includes a catalyst **38A** that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II).

17. Regarding claim 23, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

18. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba as applied to claims 1 and 20, respectively, above, and further in view of Valensa (US 2004/0089438 A1) and applicant's admitted prior art.

19. While Seaba discloses heat exchangers with plates and tubes of various configurations (see figures 3), Seaba does not disclose the heat exchanger to be a tube and fin heat exchanger or a bar and plate heat exchanger. Applicant admits these types of heat exchangers to be well known in the prior art (paragraph 28 of specification), however, and Valensa is one such example. Valensa discloses an invention for a heat

exchanger for reforming as a bar-plate combination (paragraph 49) and a tube-fin combination (paragraph 50). It would have been obvious to one having ordinary skill in the art at the time of invention to form the heat exchangers of Seaba in the configuration of Valensa to increase heat exchange efficiency as these types of heat exchangers are admittedly known in the art.

20. Claims 1, 4-6, and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi (US 5,221,524) in view of Hunter (US 4,288,346).

21. Regarding claim 1, Eguchi discloses a water-gas shift reactor system (Fig. 3A) comprising: a first stage water-gas shift reactor la receiving a reformate gas, said first stage reactor including a catalyst 2a that converts carbon monoxide and water to carbon dioxide and hydrogen, said first stage water-gas shift reactor being coupled to an inlet end of the heat exchanger by a first connector (see figure 3A); a heat exchanger 5 receiving the reformate gas from the first stage reactor; and a second stage water-gas shift reactor 7 receiving the cooled reformate gas from the heat exchanger, said second stage reactor including a catalyst 8 that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 3A, Cl/L35-65), said second stage water-gas shift reactor being coupled to an outlet end of the heat exchanger by a second connector (see figure 3A), but does not explicitly disclose said heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and-hydrogen.

22. Hunter discloses a heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 2, C6/L50-68), and it would have been obvious to one of ordinary skill in the art at the time of the invention to modify

Eguchi with Hunter for the purpose to provide a catalytic heat exchanger wherein a rapid subtraction of heat is required to improve energy efficiency (CI/L1-C2/L4).

23. Neither Eguchi nor Hunter disclose, however, that the components are integral. This is a well-known means in the art to increase heat efficiency, however. It would have been obvious to one having ordinary skill in the art at the time of invention to make integral the shift reactors and heat exchanger of Eguchi as the shift reactors surround the heat exchanger and integrating them would afford the invention better thermal efficiency. See MPEP 2144.04 V B.

24. Regarding claims 4, 5 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

25. Regarding claim 6, Eguchi discloses the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (Fig. 3A, CI/L35-65).

Conclusion

26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IMRAN AKRAM whose telephone number is (571)270-3241. The examiner can normally be reached on 10-7 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

IA

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1795